Deploying a Successful Learning Content and Student Management System using Open Source Technologies

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The UWI Open Campus is unique among the four campuses of the University of the West Indies. Unlike the other campuses, the UWI Open Campus operates in a distributed environment through the Caribbean and offers multi-mode teaching and learning services through virtual and physical site locations across the Caribbean region. In this environment, the UWI Open Campus must find ways of meeting the challenges of operating in such a varied environment.

THE UWI OPEN CAMPUS ENVIRONMENT

The UWI Open Campus is an amalgamation of the previous Office of the Board for Non-Campus Countries & Distance Education (BNNCDE), the School of Continuing Studies (SCS), the UWI Distance Education Centre (UWIDEC), and the Tertiary Level Institutions Unit (TLIU) (Open Campus Website 2010).

The Open Campus's approach in the Caribbean region is to provide a complete student experience encompassing pre-university, undergraduate, postgraduate and continuing education programmes and courses. It seeks to provide these courses through various means using distance, blended, online and face-to-face learning modes. One of the key aspects of the UWI Open Campus is its ability to provide these multi-mode services in both physical and virtual environments.

The Open Campus's virtual campus provides many of its programmes online through distance education. This is supported by a complete online learning environment including a Learning Management Systems (LMS) for course delivery and Student Management Systems for managing student data. In addition to the virtual campus, there are over 42 site locations of the Open Campus currently serving over 16 countries in the English-speaking Caribbean. These physical sites are incorporated into the virtual campus through classes via teleconferencing and live eLearning and web collaboration tools.

This combination of the various modes of learning across a distributed geographical region makes the Open Campus's approach to education unique. However, this poses a problem since the current proprietary tools that were in use at the other UWI campuses were not designed for such an environment so a decision had to be made on what tools were to be used and how they would be implemented.

CHOOSING A SOLUTION

There were many choices when it came to the development of a solution to provide the services to the students and staff of the UWI Open Campus. The choice of solutions included purchasing the software used by the other campuses and heavily modifying them so that they would fit into the UWI Open

Campus environment, writing solutions in house, modifying existing Open Source solutions and using solutions that were hosted by external organisations and purchased as a service.

In evaluating these solutions, a number of issues had to be taken into account. These included the availability of resources such as staff and funding. Also, the solutions that were to be chosen would have to provide the best fit for the organisation's needs. The UWI Open Campus made the decision for its core solutions to use the Open Source Moodle Learning Management System for its online course delivery and build its own Student Management System using Open Source Technologies such as PHP, MySQL and the Zend Framework. Additional services were chose as hosted services where the UWI Open Campus would purchase the services from external companies so that the organisation would not have to have staff and resources in-house to manage them (Fig 1.).

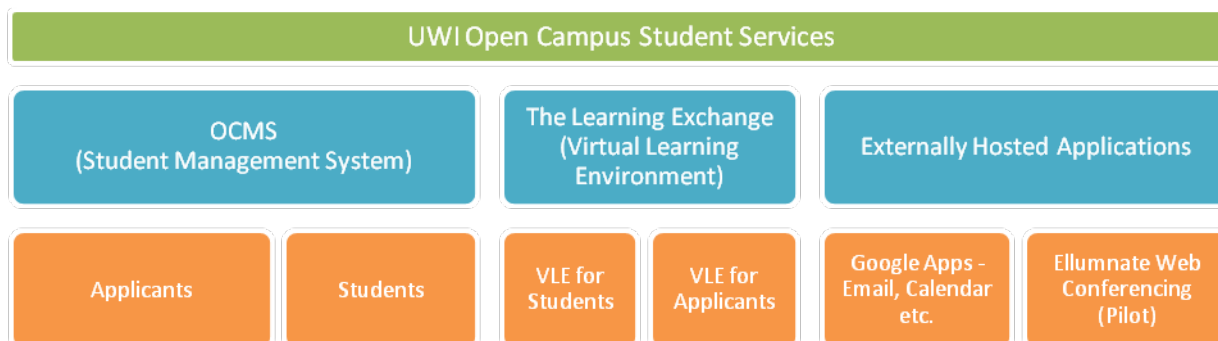| UWI Open Campus Student Services		
OCMS (Student Management System)	The Learning Exchange (Virtual Learning Environment)	Externally Hosted Applications
Applicants / Students	VLE for Students / VLE for Applicants	Google Apps - Email, Calendar etc. / Ellumnate Web Conferencing (Pilot)

Fig. 1 – UWI Open Campus Systems

The decision of building solutions using Open Source tools resulted in a shifting from the traditional paradigm of purchasing and implementing large proprietary systems to building and implementing Open Source solutions. This provided a number of benefits for the organisation.

The UWI Open Campus Student Management System (OCMS) was built from the ground up using PHP, MySQL and the Zend Framework. The OCMS provides complete management of the student life cycle from admission to graduation. It includes three main areas; a portal for applicants, a portal for students and a portal for staff. Applicants apply for their programmes through and Admissions portal. This portal allows the staff to screen applicants and then offer them a place within a programme. The applicant can accept the offer online at which time they are provisioned as a student. Once they are provisioned as a student, they can access all student resources such as Course Registration, Academic History and Financial information within the student portal. Once a student has completed the programme the system can provide them with a transcript of their courses.

The Open Source nature of these tools allowed for a great level of customisation and the large developer community endured that there was support for the technologies used. The OCMS was designed from the ground up because a number of existing solutions were evaluated but none were suitable for the various modes of courses and programmes offered and the distributed nature of the organisation.

Customising the Moodle Learning Management System allowed the UWI Open Campus to create its own custom Virtual Learning Environment. The UWI Open Campus Moodle implementation is branded as The Learning Exchange and includes a virtual environment to deliver courses to applicants (e.g. orientation and remedial courses) and students. The VLE allowed for the delivery of courses online as well as the assessment of those students. The students can interact via forums and chat rooms and access all their learning material, including text and teleconference recordings.

Moodle's Open Source license allowed full access to the code which allowed for modifications to be made for extremely tight integration with other systems and customisations to optomise performace. Also, Moodle is available for download at no cost so the cost of implementing did not include licensing fees, only the time and human resources needed for customisation.

There are also a number of externally hosted services that had to be integrated with the Learning Exchange and OCMS. One of these applications is the Google Apps for Education platform which provides email services to the students. The Google Apps platform is a hosted solution thus eliminating the need for in-house staff and infrastructure needed to maintain an email system for the students. Another externally hosted application is the Elluminate Web Conferencing system. Although still in its pilot phase, the web conferencing system integrates with the Learning Exchange allowing students and teachers to interact via synchronous web conferencing classes.

All the services are integrated using a Single Sign On system that allows students to access all of the services by only signing in once. The Identity Provider (IDP) uses the OCMS which houses the student information. When a student accesses a service, if they are not logged in, they are taken to the IDP login page. Here the student is authenticated using any of the available services and can then traverse these services without having to log in again.

Proprietary, off-the-shelf software packages that are available require a long implementation time which the Open Campus could not afford. Also, the deep integration between the applications would have been difficult, if not impossible, without access to the source code of the applications. The Open Campus is a quickly evolving organisation with many of the processes still being developed and refined and not fully implemented. As the organisation evolves, there is a need to keep pace with these changes and the Open Source nature of the tools and software used enable the organisation to quickly adapt to them.

DEVELOPMENT METHODOLOGY

The software development process used by the UWI Open Campus development team closely followed the Agile software development methodology (Fig 2). While no specific methodology was used, the process did include iterative development by a self organising team. Since the organisation relies heavily on the software developed, the goal was the rapid, continuous delivery of software which would allow the organisation to gain functionality quickly. This methodology was particularly useful since it allowed the development team to quickly adapt the changing circumstances of the organisation and accounted for the frequent late changes in requirements resulting in shorter implementation times.

Stakeholders were encouraged to prioritize their needs with outcomes based on the business value of the features that they required. This resulted in a list of the required functionality for each release of the software based on the need for that functionality. When developing the software, the functionality was broken into a number of tasks. These tasks were broken up into iterations; each iteration involving the team working through a full software development cycle which including planning, requirements analysis, design, coding and acceptance testing. Once these iterations were complete, the software was released. This method required work to be performed in a highly collaborative manner with frequent consultation between the users and the developers. The resulting systems were built in such a way that they were modular enough to be easily modified and adapted to different changes in requirements.

This method was also well suited to the small team that was available. The team comprised of only 3 developers initially with the addition of a software architect in later releases. The team was self-organising with team members taking responsibility for tasks that deliver the functionality the iteration requires and deciding individually how to meet an iteration's requirements.
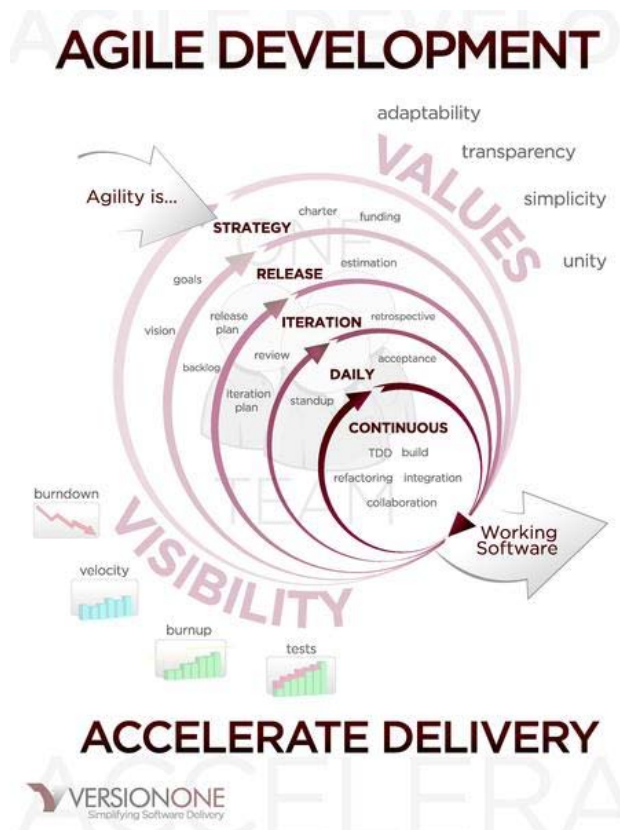
Fig 2. Agile Development

ENCOURAGING A DEVELOPMENT ECOSYSTEM

One of the important outcomes of the decision to develop using Open Source solutions was the shift in focus from spending on software licenses to spending on software development. Although the use of Open Source software meant that funding was not needed for the actual software licenses, the funding that was used was invested in the training and development of the software development team. This resulted in the building of skills within the development team with the hope of passing on these skills in order to create a sustainable environment for software development. The development team is trying to do this by bringing in student assistants who are temporarily assigned to the development team in order to learn skill in software development and development methodologies (Open Letter, 2010). The goal is to give these students knowledge and practical experience in software development that they can take to the workplace.

The UWI Open Campus tool the decision to invest in skill to create a sustainable system for the creation of technology within the Open Campus. Instead of having to import software and skills from outside the University, the skills are developed within the department and they transferred to students by giving practical experience in a live development environment. It is hoped that this investment in skills internal will benefit the university in the long term by encouraging further development within the University and outside it as well.

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